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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference MJ/GK/JOL/8112200/PCT	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).
International Application No. **PCT/SG2003/000023**	International Filing Date *(day/month/year)* 5 February 2003	Priority Date *(day/month/year)* 5 February 2003

International Patent Classification (IPC) or national classification and IPC

Int. Cl. [7] G01R 31/28, H01L 21/66

Applicant

SYSTEMS ON SILICON MANUFACTURING CO. PTE. LTD. et al

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

   [X] This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of **2** sheet(s).

3. This report contains indications relating to the following items:

I	[X]	Basis of the report
II	[ ]	Priority
III	[ ]	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
IV	[ ]	Lack of unity of invention
V	[X]	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
VI	[ ]	Certain documents cited
VII	[ ]	Certain defects in the international application
VIII	[ ]	Certain observations on the international application

Date of submission of the demand	Date of completion of the report
17 June 2004	21 December 2004
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer **RICHARD REED** Telephone No. (02) 6283 7927

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/SG2003/000023

I. Basis of the report

1. With regard to the **elements** of the international application:*

☐ the international application as originally filed.

☒ the description, pages **1 to 13** as originally filed,
pages , filed with the demand,
pages , received on with the letter of

☒ the claims, pages **15, 16, 18 and 19** as originally filed,
pages , as amended (together with any statement) under Article 19,
pages , filed with the demand,
pages **14 and 17** received on **17 September 2004** with the letter of **17 September 2004**

☒ the drawings, pages **1 to 5** as originally filed,
pages , filed with the demand,
pages , received on with the letter of

☐ the sequence listing part of the description:
pages , as originally filed
pages , filed with the demand
pages , received on with the letter of

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

4. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages

☐ the claims, Nos.

☐ the drawings, sheets/fig.

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*

** *Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report*

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	**1 to 44**	**YES**
	Claims	**None**	**NO**
Inventive step (IS)	Claims	**16 to 20, and 38 to 42**	**YES**
	Claims	**1 to 15, 21 to 37, 43 and 44**	**NO**
Industrial applicability (IA)	Claims	**1 to 44**	**YES**
	Claims	**None**	**NO**

2. Citations and explanations (Rule 70.7)

The following documents were cited in the associated International Search Report:

D1 = Patent Abstracts of Japan, JP 2001-326258 A (TOKYO SEIMITSU CO. LTD) 22 NOVEMBER 2001 & machine translation obtained on 12 March 2003 from "www1.ipdl.jpo.go.jp/PA1/cgi-bin/PA1INIT?". See abstract and description including paragraphs 2, 3, 4 and 10.

D2 = US 6257958 B1 (ANGELL et al) 10 JULY 2001. See abstract, drawings and description including column 7 lines 1 to 65.

D3 = US 6218848 B1 (HEMBREE et al) 17 APRIL 2001. See abstract, drawings and description including column 1 line 54 to column 2 line 21, column 2 line 53 to column 3 line 8, and column 8 lines 55 to 67.

D4 = Patent Abstracts of Japan, JP 10-209231A (NIPPON STEEL CORP.) 7 AUGUST 1998 & machine translation obtained on 12 March 2003 from "www1.ipdl.jpo.go.jp/PA1/cgi-bin/PA1INIT?" See abstract and description including paragraphs 7 to 10 and 23 to 31

Novelty

The claims as now amended require that an electrical characteristic of the probe needles be determined. Document D1utilises a CCD camera to visually determine whether the probe needles are clean or not. Accordingly all claims must be novel.

The applicant has submitted that Document D2 teaches probe needle testing after a set number of tests have been conducted rather than upon a reported die failure. As all claims require the probe to be tested upon a reported die failure then all claims must be novel.

Document D3 does not explicitly state that the probe needles are tested for cleanliness upon reported failure of a die. Rather, it teaches as an initial step checking the cleanliness of the probe needles by checking resistivity prior to testing a die. As all claims require the probe to be tested upon a reported die failure then all claims must be novel.

Document D4 does not explicitly state that the probe needles are tested for cleanliness upon reported failure of a die. Rather, it teaches at column 7 line 5 to 10 as part of the production test program the resistivity of the probe pins is checked to determine if cleaning is required. What triggers the checking of probe pin resistivity is unclear. It should be noted that the production test program is different from the cleaning cycle. Accordingly, as all claims require the probe to be tested upon a reported die failure then all claims must be novel.

Inventive Step

Document D1 does not teach or suggest testing electrical characteristics of a probe needle. It follows then that D1 does not teach or suggest the claimed invention.

Continued in Supplemental Box.

Supplemental Box
(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of

As indicated by the applicant, document D2 teaches the probe needles being cleaned after a set number of tests. The number of tests between cleaning is clearly an approximation of when the probe needles are likely to need cleaning. Likewise, it would be accepted that at times the number is too great whilst at other times it is too short. This is inherent in any "number between tests" schemes. An obvious alternative is to check the probe needles upon report of a die failure. If the probe needles are dirty, a well known problem leading to false negatives then the probe needles should be cleaned, if the probe needles are clean then die is truly a failure. Claims 1 to 15, 21 to 37 and 43 and 44 are considered to define an invention that does not involve an inventive step.

Document D3 teaches as an initial step checking the cleanliness of the probe needles by checking resistivity prior to testing a die. Accordingly, any reported die failure would be presumed true rather than a false negative. It follows then that D3 does not teach or suggest the claimed invention.

Document D4 teaches checking probe needle resistivity as part of the production test program. The examiner does not concur that D4 explicitly teaches this checking occurring only after a set number of tests. Nor does the examiner consider it to teach only checking resistivity prior to performing a test. As indicated in the application and well supported by the cited documents, lack of cleanliness of probe needles is a well known factor in dies being falsely reported as failing. Nothing has been presented that satisfactorily addresses the question why it is not obvious to check probe needles prior to finalising a failure of a die. As indicated by D3 one obvious option is to check the probe needles prior to conducting a test. Another obvious option, knowing the dirty needles is a cause of false negatives, is to check the probe needles upon reporting a failure. Claims 1 to 15, 21 to 37 and 43 and 44 are considered to define an invention that does not involve an inventive step.

Documents D1, D2 and D4 all relate to die testing and the cleaning of probe needles. Each recognises the problem of dirty probe needles. The combinations of a) D1 and D2, and b) D1 and D4 are obvious. Document D1 teaches checking the probe needles upon reporting a die failure and both D2 and D4 each teach testing the resistivity of the probe needles. Claims 1 to 15, 21 to 37 and 43 and 44 are considered to define an invention that does not involve an inventive step.

Industrial Applicability

The claimed invention has industrial applicability in the field of integrated circuit manufacture and testing thereof.

CLAIMS

1. A method for optimizing cleaning of a probe card including:

using the probe card to test the functionality of dies on a wafer;

when a die fails the probe test, and the probe reports failure to contact the pads of the die, assessing an electrical characteristic of the probe needles; and

if the electrical characteristic of a probe needle is greater than a predetermined value triggering probe needle cleaning.

2. A method for optimizing cleaning of a probe card as claimed in claim 1 wherein the probe needle cleaning is performed by a separate device.

3. A method for optimizing cleaning of a probe card as claimed in claim 1 or claim 2 wherein the tester module controls the probe and probe module.

4. A method for optimizing cleaning of a probe card as claimed in claim 3 wherein the tester is arranged to assess whether the probe test is a pass or a fail.

5. A method for optimizing cleaning of a probe card as claimed in any one of claims 1 to 4 wherein if the test is a fail the tester module is further arranged to determine whether or not to skip the die.

6. A method for optimizing cleaning of a probe card as claimed in claim 5 further including the step of re-probing the die if the die is not skipped.

7. A method for optimizing cleaning of a probe card as claimed in claim 6 wherein if the re-probe produces a pass result, the tester module is further arranged to assess whether the maximum number of dies per clean has been exceeded.

8. A method for optimizing cleaning of a probe card as claimed in claim 7 further including the step of cleaning the probe needles if the maximum number of dies per clean has been exceeded.

when a die fails the probe test, the probe card is further arranged to report failures to contact the pads of the die to a tester module, the tester module arranged to assess an electrical characteristic of the probe needles; and

if the electrical characteristic of a probe needle is greater than a predetermined value the tester module is arranged to trigger probe needle cleaning.

24. A system for optimizing cleaning of a probe card as claimed in claim 23 further including a separate device arranged to perform the probe needle cleaning.

25. A system for optimizing cleaning of a probe card as claimed in claim 23 or claim 24 wherein the tester module controls the probe and probe module.

26. A system for optimizing cleaning of a probe card as claimed in claim 25 wherein the tester module is arranged to assess whether the probe test is a pass or a fail.

27. A system for optimizing cleaning of a probe card as claimed in any one of claims 23 to 26 wherein if the test is a fail the tester module is further arranged to determine whether or not to skip the die.

28. A system for optimizing cleaning of a probe card as claimed in claim 27 wherein the tester module is further arranged to instruct the probe to re-probe the die if the die is not skipped.

29. A system for optimizing cleaning of a probe card as claimed in claim 28 wherein if the re-probe produces a pass result, the tester module is further arranged to assess whether the maximum number of dies per clean has been exceeded.

30. A system for optimizing cleaning of a probe card as claimed in claim 29 wherein the tester module is arranged to instruct cleaning the probe needles if the maximum number of dies per clean has been exceeded.